Panasonic’s advanced packaging technologies for thin substrates

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Panasonic’s 4 Business Groups and Our Company

- **Appliances**
- **Eco Solutions**
- **AVC Networks**
- **Automotive & Industrial Systems**

**Panasonic Factory Solutions Co., Ltd.**

- **Head Office**: Osaka, JAPAN
- **Establishment**: January 1, 2003
- **Funding**: 100% from Panasonic Corp.
- **Paid-in capital**: 15 billion yen
- **Employees**: 2,870 (World wide)
- **Business Area**: Electric Component Mounting, Microelectronics Systems etc.
Product Portfolio - Electronic Circuit Manufacturing Solution -

Frontend & Pre-assembly
- Plasma Dry Etcher
  - APX300
- Die Bonder
  - MDP Series

Package Assembly
- Bare Die
- Image Sensor
- SAW filter
- Pre-assembly

Flip Chip Bonder
- FCB3
- APX300

Module Assembly
- RF Module
- LCD Panel
- GPS Module

PCB Assembly
- Mother Board
- FPC
- SAW filter

Final Product

Plasma Dicer
- APX300

Plasma cleaner
- PSX307

SMD System
- NPM Series

IC fabrication

Product Portfolio - Electronic Circuit Manufacturing Solution -

The 64th Electronic Components and Technology Conference (ECTC 2014)
Requirements for thin-substrate Manufacturing

Mounting “thin-Si die/component” on “thin-substrate” is essential!

Key requirements

- Strength of thin-die
- Reliability of Interconnect
- Support thin-substrate

Flexibility + “more Functions in Small Volume”

Source) LG
Source) SAFE KEEPER CARD
Source) Fitbit Flex

Source) zxhgroup.com
Panasonic’s PKG Solutions for thin substrate

Strength of thin-die

Plasma Dicing

Reliability of Interconnect

Plasma Cleaning

Support thin-substrate

e-Carrier (Electrostatic Force)

Source: Win Industry

Flexible Substrate

Cover

Electrostatic carrier

Die

Substrate

Wire

Electrode

SMD Process

DC
What is “Plasma Dicing”?

Blade Dicing vs. Plasma Dicing:

- **SOLID based**
- **Dry Etching based**

Diagram showing the process:
- SF$_6$ + O$_2$ reactants
- SF$_x^+$ ions
- F*, O* free radicals
- SiF$_4$ etc.

Sidewall protection layer is highlighted in the diagram.
Blade Dicing vs. Plasma Dicing

Top View

- Blade Dicing: 60 μm
- Plasma Dicing: 20 μm

TEM Image

- Damaged layer (500 nm thick) in Blade Dicing
- Coating carbon and amorphous layer in Plasma Dicing

Cumulative Frequency of Chip Strength

- Blade Dicing: Blue diamonds
- Plasma Dicing: Red squares

3 points bending test result

Strong thin-die by Plasma Dicing!
Plasma Dicing – Makes dies stronger –

Highest Strength Dies

Circular

Hexagonal
Plasma Cleaning – PoP interconnection –

■ TMV (Through Mold Via) process

Before plasma

Smears (Residues)

Carbon:

Atomic Concentration (%)

Sn

Solder Ball

Bottom PKG

Laser

Mold-resin

Top PKG

Plasma Cleaning

After plasma

Smears (Residues)

Atomic Concentration (%)

Sn

Carbon

XPS depth profile on solder ball surface

Reliable Solder Joint after cleaning!

XPS : X-ray Photoelectron Spectroscopy
Contribute to your thin-sub. manufacturing!

**Plasma Dicing**

**Chip Bonding**

**Plasma Cleaning**

**Handling**

Panasonic’s PKG techniques

- APX300
- MD-P200US
- PSX307
- Source: Win Industry
- e-carrier